# INSTRUCTION MANUAL

# FOR THE

# WEINSCHEL MEASUREMENT BENCH

# MODEL MB-1

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Weinschel Engineering
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# SECTION ONE

# GENERAL INFORMATION

## 1.1 Scope of the Manual

This manual covers the description, features, set-up procedures and operating instructions for the Weinschel Model MB-1 Precision Measurement Bench.

## 1.2 Purpose of the Measurement Bench

The MB-1 is primarily intended as an aid to the precise calibration of coaxial microwave devices. It is designed to eliminate mechanical misalignment of test equipment and devices under test in coaxial measurement systems; thereby reducing errors which result from such misalignment.

## 1.3 Specifications

### 1.3.1 Alignment

Repeatable measurement junction insures alignment of "in-line" coaxial devices for insertion loss and VSWR tests.

### 1.3.2 Auxiliary Equipment - Tuners

Tuner block supports and clamps Weinschel double stub tuners DS-109, DS-109L, DS-109LL and DS-109H. Tuner Block Adapter, Model MBX-1 available to operate measurement bench without tuner or with other makes of tuners (see fig. 2).

### 1.3.3 Auxiliary Equipment - Slotted Lines

Line blocks locate and secure commercial slotted lines such as Hewlett-Packard Models 805A and 809B, and Narda Model 230B.

### 1.3.4 Available Insertion Length

Devices measuring 26 inches in length can be inserted for test.

### 1.3.5 Equipment Hold-down Clamps

Fast acting clamps of swivel and thumb-screw type for quick component changeover.

### 1.3.6 Weight

Lightweight - only 23 lbs. total.

### 1.3.7 Maximum Physical Dimensions

5 ft. long x 8 3/4 in. wide x 3 in. high.
Height at tuner block: 5 inches

1.3.8 Materials and Finish

1.3.8.1 Hardware

Stainless Steel

1.3.8.2 Structural Members

Aluminum; Anodized or Iridited

1.3.8.3 Side Strips

Hand rubbed mahogany

1.3.9 Portability

Can be easily moved by one or two persons. Hand slots provided for this purpose are incorporated.

## 1.4 Description

The Model MB-1 Measurement Bench consists of two distinct areas combined as an integral unit. The one section contains support blocks and clamps for mounting commercial slotted lines as mentioned in section 1.3.3, while the remaining section consists of means to locate and transport tuning devices and detectors (see section 1.3.2). A typical arrangement and use would be to place a slotted line, double stub tuner and detector in the appropriate places (see fig. 1 ) and align all equipment for proper mating of associated connectors. This is facilitated by adjustment of the sliding tuner block which locates and locks the tuner and detector assembly so as to be properly oriented with the slotted line. The measurement junction (connection between the tuner and slotted line) can now be connected and disconnected as often as required; always mating with rapid precision. In this manner, errors due to mechanical misalignment become insignificant. Single or repeated measurements can be made quickly and precisely.

In a typical insertion loss measurement of an attenuator, for instance, one would merely note the detector output level with the measurement junction connected; disconnect the junction and move the tuner assembly almost effortlessly away from the slotted line; insert and connect the attenuator between tuner and slotted line; and read the new output level of the detector. It will be noted in operation that no "juggling" of connectors is needed for alignment; the entire operation thereby becoming smooth, effortless, more precise and more efficient.

In cases where tuners different from the Weinschel hexagonal type are used, or where no tuner is used at all, the Model MBX-1 Tuner Block Adapter is an available accessory which adapts the moving tuner support almost universally. This consists of a short section of

coaxial line; $Z_o$ = 50 ohms. The body is hexagonal nickel plated brass and the connectors are stainless steel; one each type "N" male and type "N" female. The adapter is characterized by low insertion loss and low VSWR over a wide band.

The measurement Bench, itself, is supported on four shock absorbing rubber feet. Due to the design of the bench, no especially flat mounting table is required for its operation; normal work tables will suffice.

1.5 Maintenance

Due to the use of corrosion resistant finishes and materials, no elaborate maintenance is necessary. The bearings in the tuner block assembly require no special oiling as the device does not operate at high speeds or with heavy loads. Oil applied to the bearings or traverse rods will tend to collect dust and inhibit the action of the moving mechanism. The precision ball bearings are stainless steel and the traverse rods are type 1060 steel, 60 case hardened, with hard chrome plate. These bearings and rods mate to each other with tolerances less than .0005 inch. It is, of course, advisable to keep large accumulations of dust and dirt from forming over the bench. To aid in this, a dust cover made of 15 mil clear vinyl is supplied and should be placed on the bench when it is not in use. In all, the Model MB-1 should give years of untroubled operation.

1.6 Unpacking and Preparation for Use:

The MB-1 is shipped in an appropriate packing case with adequate inner cushioning material. Care should be exercised in removing the packing material and the instrument, itself. There should be no loose items except the instruction manual and packing slip or other papers.

All hardware should be in place.
A bag containing a screw and rubber bumper should be attached to a tuner block thumb-screw (See fig. 3).
After unpacking the device, examine it for mechanical damage. If any is found, notify the shipping company immediately.

Inspect the measurement bench carefully to ascertain that all clamps and thumb-screws are in place. Place the bench on a suitable table or support and check for proper operation of the bearing housing and traverse rods as follows:

1.6.1 Shipping Bolt (See fig. 3)

The bearing housing is kept from sliding along the traverse rods during shipment by a cushioned bolt which secures the housing to the center rod block. Remove this bolt so that the bearing housing is free to move along the traverse rods. Install the rubber bumper and screw assembly into the hole in the bearing housing that the shipping bolt was removed from (the bumper and screw will be found in a bag attached to a tuner block thumb-screw).

### 1.6.2 Bearing Housing

After installation of the bumper, grasp the tuner block assembly and move it along the traverse rods. Note that the action should be smooth for the entire available travel length. The bearing housing should not be loose on the rods and should allow motion along the rods only.

END -- SECTION ONE

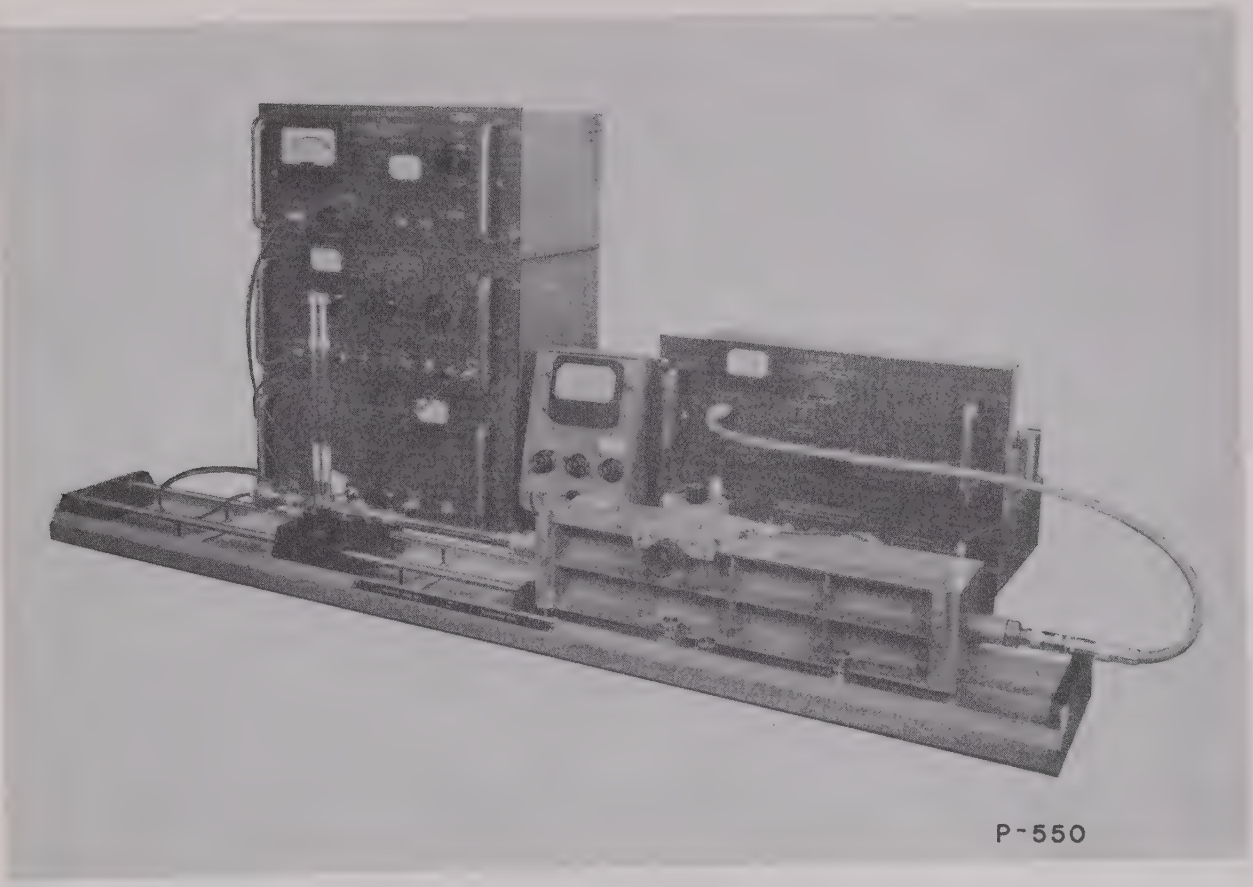



FIGURE #1

MB-1 WITH SLAB TYPE SLOTTED LINE

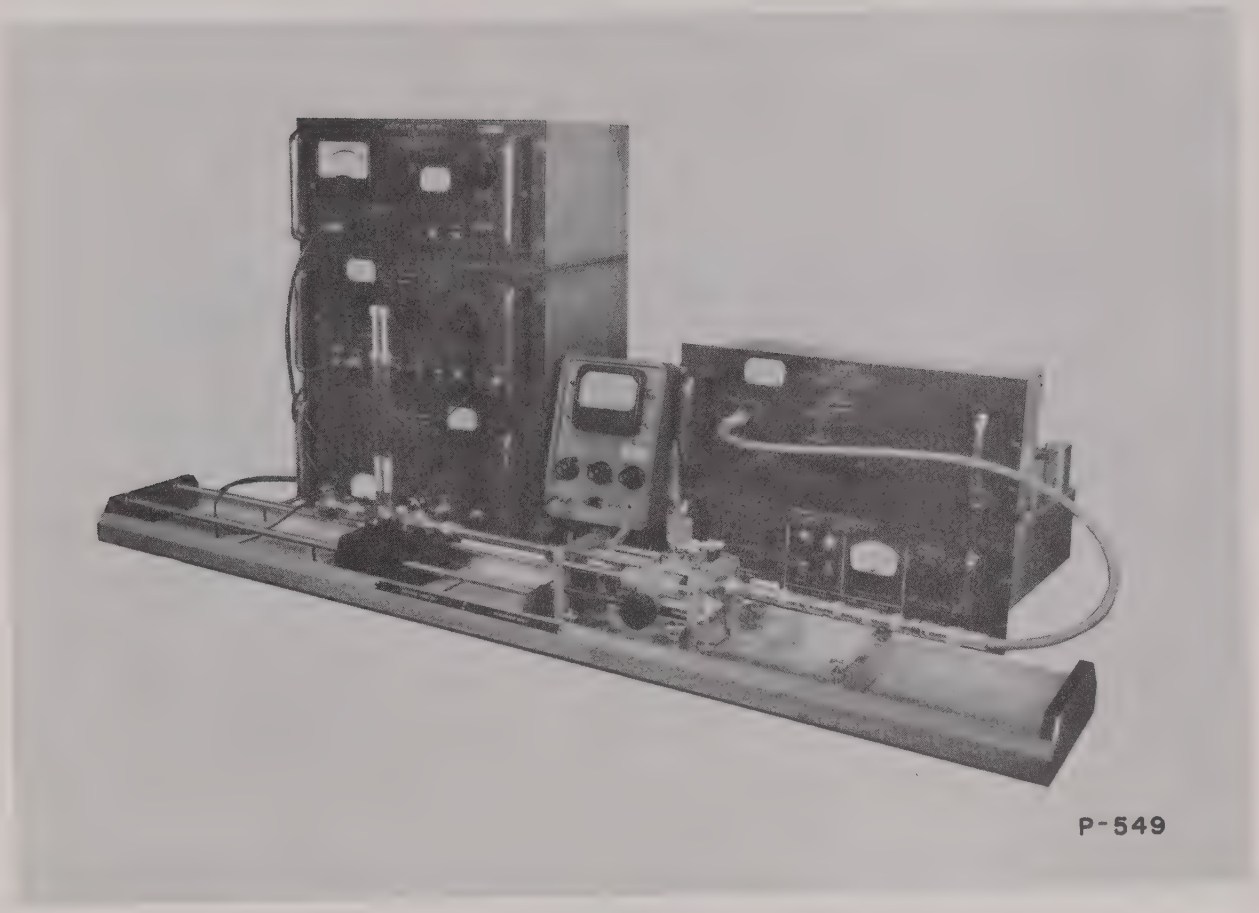



FIGURE #1A

MB-1 WITH SLOTTED SECTION AND CARRIAGE

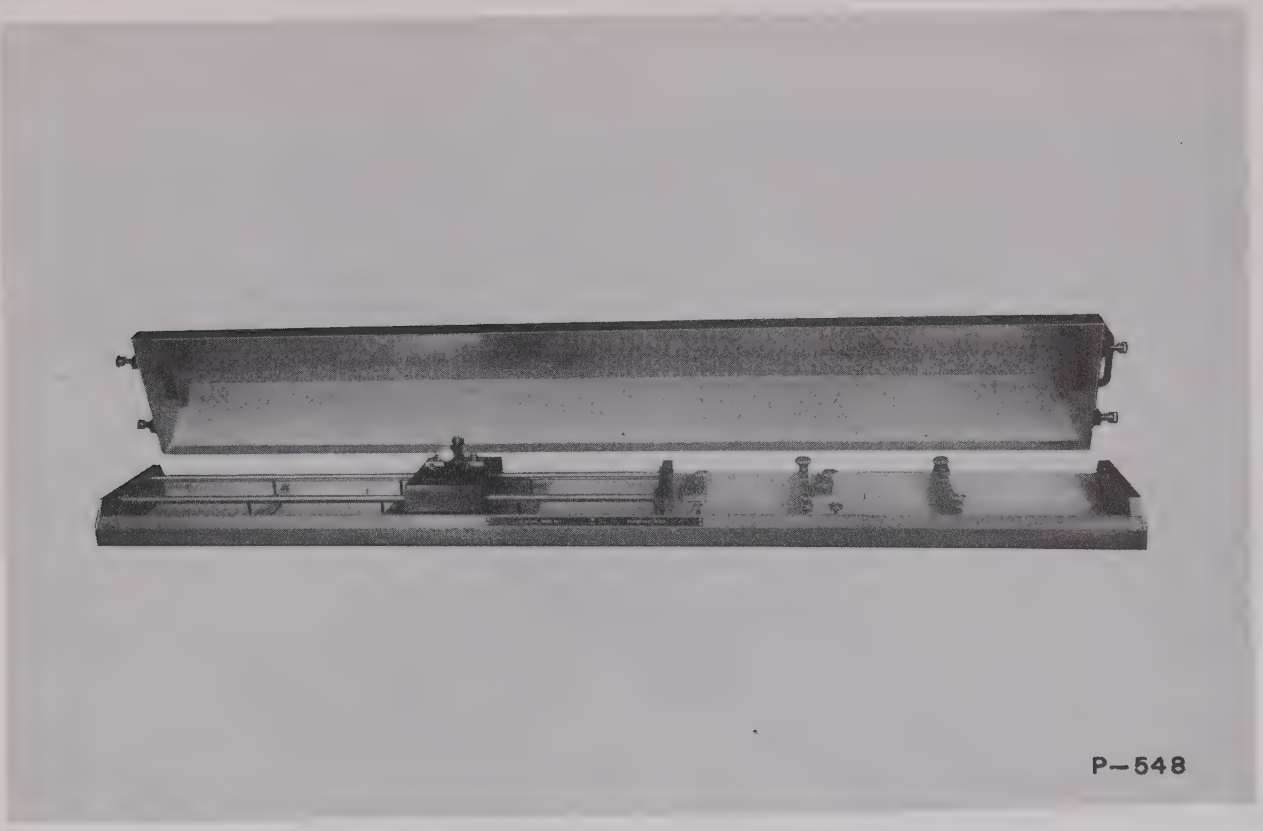



FIGURE #2

MB-1 WITH MBX-2 RIGID COVER

FIGURE #2A

MBX-1 TUNER BLOCK ADAPTER

## SECTION TWO

## SET-UP AND OPERATING INSTRUCTIONS

(Refer to fig. 3 for reference letters)

### 2.1 Initial Set-up and Alignment

The following procedures should be followed to insure proper alignment for measurements. After several such setups have been made, the operator will find only a few minutes are required to make additional setups.

#### 2.1.1 Tools Required

A screw driver or, preferably, a hex nut-driver must be used for adjusting the tuner block.
A screw driver is used to set the initial position of the slotted line clamps.

#### 2.1.2 Procedures

The set-up should commence as follows:

1. Insert carriage similar to H-P Model 809B on line blocks and secure by clamps (B) or; insert slotted line similar to H-P Model 805A or Narda Model 230B on cross members and secure by clamps (A).
   Note: At this time it may be necessary to adjust the nominal height of the clamps (A) or (B) by use of a screwdriver and the spring-loaded center screws. This should be a one-time adjustment. Notice that the clamps swivel and slide over the feet or bases of the slotted lines. Turning the thumb-screws down clamps the lines.

2. Insert Double Stub Tuner or Model MBX-1 Tuner Block Adapter into tuner block (F) and secure for firm fit by turning in clamping screws (E). Extreme clamping pressure is to be avoided.

3. Loosen jack screws (C) and hold-down screws (D) so that tuner and tuner block enjoy freedom of movement. A hex nut-driver or screwdriver is used for this.

   CAUTION
   Try not to remove hold-down screws (D) completely from tapped holes in bearing housing (G).

4. Connect tuner assembly to slotted line and hand tighten joint for rigid support. Maintain the surface of the tuner block (F) as nearly parallel to the bearing housing (G) as is practical.

   At this point the assembly should appear as follows:

The slotted line should be clamped to the measurement bench, the tuner should be rigidly connected to the line and the tuner block should be firmly attached to the tuner.

If one were to grasp the bearing housing and move it back and forth slightly on the rails, the tuner and tuner block would not move with it.

5. Move the bearing housing back and forth and note its total excursion in relation to the fixed tuner block. Set the housing at the center of the travel.

6. Turn in jack screws (C) until they just touch the upper face of the bearing housing beneath the tuner block. A "crosswise" rather than a "rotating" order is best in adjusting each of the four screws individually. The hex nut-driver is again used for this.

7. Turn down the clamping screws (D) for a snug fit. Again, undue pressure should be avoided.

8. Disconnect tuner from slotted line and push tuner assembly along rails away from line. Return tuner assembly to connector on slotted line and note that connectors should engage freely.

9. Reconnect tuner assembly to slotted line and tighten clamping screws (D) and (E) for firm retention. Jack screws (C) should not be touched.

Setup should now be complete. If misalignment is noted, it is probably due to one of the following:

(a) Jack screws not properly adjusted to rest on surface of bearing housing.
(b) Extreme pressure applied on tuning block hold-down screws (D).

If proper alignment is not obtained, repeat entire adjustment procedure.

2.1.3 Reverse Alignment

If measurements in the reverse direction are now desired, realignment can be accomplished as follows:

1. Loosen tuner clamp screws (E), lift and rotate tuner 180° (changing detector appropriately), reinsert tuner and tighten tuner clamp screws.

2. Unclamp slotted line and rotate 180°. Do not reclamp line. If the H-P 806B section is being used with the H-P 809 carriage, it should be necessary to rotate the slotted section only, not the carriage.

3. Bring tuner assembly into contact with the slotted line. In the case of the H-P 806B section, the junction should line up immediately. If it doesn't, loosen the clamping screws which hold down the carriage.

   Connect the junction between tuner and slotted line (the line should be moved about to accomplish this). Make this junction tight.

4. Retighten the slotted line hold-down clamps.

5. Disconnect the coaxial measurement junction, move the tuner away and then back to the junction. The junction should align properly.

6. If reverse alignment does not occur, refer to procedures in section 2.1.2 (above).

## 2.2 Operating Procedures

### 2.2.1 General

The operating methods of the measurement bench become self-apparent when a measurement is to be made. That is to say, the junction between the tuner and slotted line is disconnected, the device under test inserted, and the junction reconnected.

### 2.2.2 Measurements of slightly mis-aligned devices

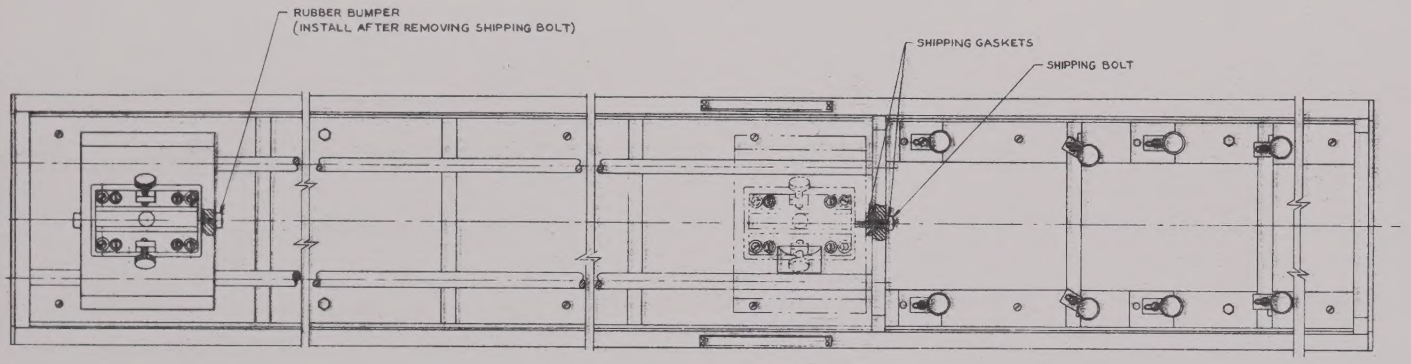
It may occasionally be observed that an extremely long device will not seem to align precisely when inserted for test. This is due to some misalignment in the device under test itself. To avoid problems of this type, the following procedure should be followed when inserting units for test:

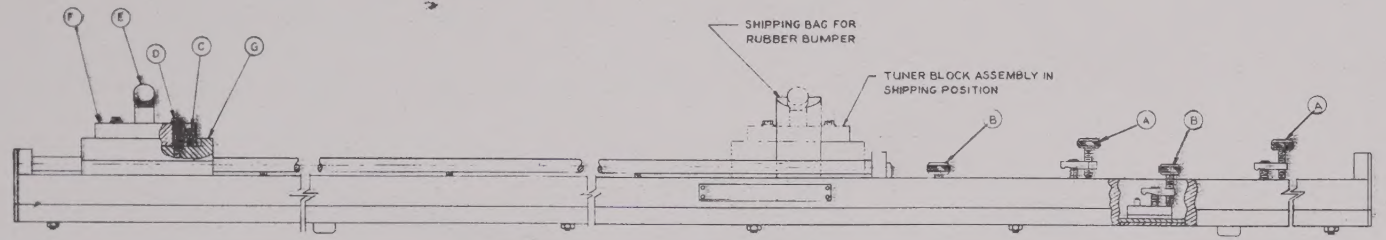
1. Attach device to be measured loosely to the tuner.

2. Bring other end of device to connector on slotted line and make a tight junction.

3. Tighten connection at tuner.

END -- SECTION TWO

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MS-1 REFERENCE DRAWING FOR
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FIGURE 3

SCALE 1/2

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